COMPARISON OF THREE BREASTSTROKE SWIMMING INSTRUCTION PROGRAMMES FOR 8 TO 9 YEAR OLD CHILDREN

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Abstract:

Two experimental swimming instruction programmes were drawn up and compared with an established swimming programme at a swimming school in Ljubljana. The programmes of the experimental group differed from that of the control group in content whereas the experimental programmes differed in the duration of swimming instruction. The study included 370 pupils aged 8 to 9 years. To prove our presuppositions, a pedagogic experiment was carried out, in which each group had its own prescribed swimming instruction programme. The group and gender differences in swimming skills were analysed by means of Pearson's c2 test. The results showed that significant statistical differences were present in the final swimming skills of the test subjects who were included in the different programmes. Statistically, there were significant differences in the final swimming skills of the test subjects from the control group and those of the experimental groups, whereas no significant statistical differences were observed in the two experimental groups despite the different duration of the programmes. The comparison of the swimming skills regarding gender also showed significant statistical differences in the structure of marks given to boy[s] and girls. We anticipate that almost optimal conditions for swimming skills acquisition for this age group were met by means of this experimental programme. However, the programme had a greater effect on boys than on girls.

Key words: *children, swimming instruction, breaststroke, comparison of programmes*

INTRODUCTION

Many efforts have been devoted in recent years to the improvement of swimming skills instruction programmes in Slovenian elementary schools. Still, the testing of swimming skills among primary school children has not producted encouraging results, since one fourth of the upper level primary school children cannot swim properly (those whose skills are marked 4 or lower, Table 1) (Jurak & Kovač, 1998). The reported poor swimming skills may be primarily the result of less effective swimming instruction programmes. The aim of our study was to find a more effective method of swimming instruction. We assumed that our aim could be achieved by a more up-to-date, methodically better way of swimming instruction, where the process of teaching is based on the use of appropriate and various didactic devices and equipment, and by a better timing of the teaching process.

In the history of swimming instruction different methods have been developed, ranging from the simple way of imitating how animals swim to more complex methods based on the competitive results,

and finally to the methods of instruction based on the principles of human development. Ever since the organised ways of swimming instruction were developed, questions about the methodological, organisational and psychological effectiveness of particular swimming instruction programmes have remained unanswered. The majority of authors agree that the most appropriate way of swimming instruction is the method of a concise swimming course. Recent research (Flisek, 1995; Grgič-Zubčević, 1996) has shown he trends towards the reduction in the number of classes, i.e. between 10 to 15 classes over a period of 14 days to one month. A survey of the programmes shows that different researchers assess the effectiveness of the swimming instruction of various techniques of swimming. Grgić-Zubčević (1996) claims that for girls the most efficient programme of swimming instruction is a combined way of swimming (the combination of the kicking action in the front crawl stroke and the arm action in the breaststroke), and for boys the most appropriate stroke is the front crawl. Kazazović and Hadžikadunović (1988) say that the front crawl is the best for boys and breaststroke and backstroke are the best for girls. The majority of researchers tend to use only a few devices for swimming instruction, although Flisek (1995) confirms the importance of the use of swimming instruction devices. As for the instruction method most researchers have used the classical way of swimming, like in the front crawl.

MATERIALS AND METHODS

Three different swimming instruction programmes were compared for their efficiency in the instruction of swimming skills in schoolchildren. Two experimental programmes of swimming instruction (1 and 2) were compared with an established programme of one of the swimming schools in Ljubljana (0). The experimental programmes differed from the established one in content, and the experimental programmes differed from each other in the duration of swimming instruction. The control programme (0) and the first experimental programme (1) consisted of 10 classes each lasting for 60 minutes over a period of 10 days, while the second experimental programme (2) consisted of 15 classes each lasting 90 minutes over a period of 10 days. Breaststroke techniques were taught in all three programmes. A pedagogical experiment, in which each group had its own prescribed swimming instruction programme, was carried out to find out the differences. The research was carried out on schoolchildren aged 8 to 9 years and attending the second class of 53 primary schools from Ljubljana and its suburbs. Prior to the beginning of the programme, the parents and the principals of the children's schools had been informed about our aim and about the course of the research, and their written consent had been obtained. The children from these schools

Table 1: *Swimming skills assessment standards*

Numeric mark	Descriptive mark	Task	Award
1	Non-swimmer Water acclimatisation level 1	The child is capable of floating stretched on the water surface for 5 seconds, arms stretched forwards (along side the body). The child floats on his/her chest, head down in the water.	Bronze Sea Urchin
2	Non-swimmer Water acclimatisation level 2	The child swims for 8 metres in a free technique without interruption and without touching the bottom of the pool, the edge of the pool or another swimmer. The swimming starts in the water.	Silver Sea Urchin
3	Non-swimmer Water acclimatisation level 3	The child swims for 25 metres in a free technique without interruption, without touching the bottom of the pool, the edge of the pool or another swimmer. The swimmer can cover the distance in one direction, and in shorter pools in both directions. The swimming starts in the water or with a jump into the water, but the distance should not be shorter than 25 m.	Golden Sea Urchin
4	Non-swimmer Water acclimatisation level 4	The child swims for 35 metres in a free technique without interruption, without touching the bottom of the pool, the edge of the pool or another swimmer. The swimmer can cover the distance in one direction, and in shorter pools in both directions. The swimming starts with a jump into the water.	Little Dolphin
5	Swimmer Water acclimatisation level 5	the swimmer swims for 50 m starting with a jump, swims in one direction for 25 m, turns around while swimming and continues swimming towards the finish. While swimming the second 25 m, the swimmer stops in the middle of the pool and does the so-called safety exercises – from a lying position on his/her chest he/she turns through the upright position into the lying position on his/her back, repeating the procedure through the upright position back into the prone position – then the swimmer continues swimming to the finish line.	Bronze Dolphin

Source: Jurak, Kovač & Strel, 1998

participated in the individual groups on the basis of their willingness to cooperate in the research. The schools that were able to adapt their classes to the swimming course that lasted for a longer period of time were put in group 2, the others, however, were randomly classified in groups 0 and 1. The experiment was carried out in the school-year 1997/98 over a period from October to June in the Tivoli indoor swimming pools in Ljubljana. The smaller swimming pool was from 0.8 m to 1 m deep, and the depth of the large one was from 1.8 m to 2 m. The water temperature in both pools was 28°C, and the air temperature was 30°C. The swimming instruction was conducted by 27 swimming instructors with similar characteristics: training (80 % had the title of instructor 1 according to the European classification of jobs in sport), experience (73.3 % had up to 3 years of experience), permanent work (the majority had taught for 2 years without interruption) and education (47 % were students of the Faculty of Sport). 33 % of the swimming instructors were female.

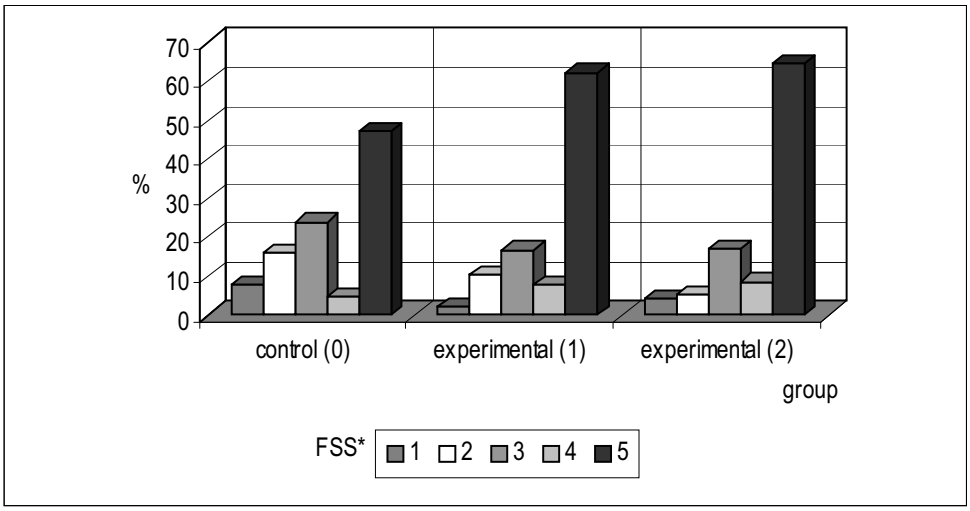
To determine the basic swimming skills of the subjects some initial tests were taken. Only the subjects who got mark 1 in the testing procedures (Table 1) were included in the programmes, so that each group's mean mark of swimming skills was initially similar. According to the total number of children who took part in the swimming courses, almost 40 % of children had such a proficiency level. All the subjects were tested by the same team of swimming instructors. Only the results of those who were present at all the exercise units were considered. (The mean drop-out in all the groups was 21.1 % due to absence). The number of subjects was 370.

For the assessment of the swimming skills of the test subjects we implemented the standards which have been used in Slovenia since 1 September 1997 (Jurak, Kovač & Strel, 1998). For the purpose of our research we used a 5-level scale containing official standards from 1 to 5 (Table 1). Since 1989 the demonstrated competency of the task under level 5 has been considered as a standard for identifying an individual as a swimmer (Šink, Kapus, Prešern & Cankar, 1990).

When introducing the experimental programmes, we emphasised the graduality of implementing the methodical units, and the improvement of the swimming skills. The programme contained two levels of swimming instruction: the first 5 exercise units of separate motor structures of the breaststroke, and the second 5 exercise units of combining with motor skills using the breaststroke. For each level of swimming instruction separate goals of training were defined. To reach the target goal, 14 methodical units were used and improved. As early as from the 6th unit onwards the children progressed and practised in the large swimming pool. The groups consisted of 8 non-swimmers per instructor, but the practice was planned in such a way that the instructor could combine the original groups into larger ones, or split them up into smaller groups, depending on the proficiency of swimming skills and the instruction programme. A lot of group exercises were included in the programme, mainly in the form of games, obstacle courses, relays and additional tasks with special goals. Individualisation was also implemented during the exercises. The children with difficulties in particular motor skills were separated from the main activities and given additional tasks, and then they returned to practicing the main activities. The integration and the division of the groups enabled us to differentiate between the group levels, which added quality to the individualisation of the training. Swimming skills were tested four times to get feedback on the effectiveness of the instruction and to encourage the children. In the programme of the control group (0) the testing of the swimming skills took place at the beginning (1st exercise unit) and at the end (9th exercise unit). In the experimental groups the testing was also carried out in the 4th and 7th exercise units (intermediate controls were not introduced in the control group, since that would have disrupted the usual process of work). The testing was carried out in the form of obstacle course negotiating with various tasks, one of them being dedicated to swimming skills testing. Special signs (cartoons) placed in certain selected areas served to encourage the children for a specific standard of swimming skills. This enabled the children to closely follow their own progress in the learning process. In addition to the devices used when working with the control group (swimming boards, inflated swimming balls, swimming buoys, air mattresses, slides, rings, floating poles, etc.) sinkable articles, underwater tunnels, floating buoys, balls of different sizes and colours, floating baskets, anchors, balloons and cartoons were also used in the experimental groups. There was also an important difference in the use of music. The control group practised without music, whereas music was often used in the experimental groups. To diversify swimming instruction with the experimental groups, water jumps and distracting games were also included in the programme for the purpose of relief and relaxation after the intensive learning in the exercise units.

The differences in the final swimming skills were analysed by means of Pearson's c^2 test.

RESULTS



FSS - Final Swimming Skills (Table 1 standards)

***Figure 1**: Distribution of final swimming skills test results according to the groups*

The comparison of the distribution of results of final swimming skills (TSS) (Figure 1) showed statistically significant differences ($p<.018$) in the swimming skills in the subjects who participated in the different programmes. There was a significant statistical difference in the final swimming skills between the subjects from the control group and the experimental groups (between 0 and 1 $p<.032$; between 0 and 2 $p<.007$). No significant differences ($p<.587$) were found between the experimental groups despite the different duration of the programme. According to the number of test subjects from the groups, more test subjects from the experimental groups gained a higher mark in the final swimming skills (marks 3, 4, 5; Figure 1). A conclusion can therefore be drawn that significant differences are in favour of the test subjects from the experimental groups, and that the test subjects from the experimental programmes were more successful in the final testing of swimming skills.

The comparison of the swimming skills between genders showed statistically significant differences in the structure of the marks given to boys and girls (Table 2). A further analysis of the structures of marks for the final swimming skills given to both genders was made for each group separately, and the results showed significant statistical differences only in the control group.

The comparison of the performance scores for the final swimming skills in the control group (Table 3) showed that according to their relative number in the group, the girls were given a much larger number of mark 5 than the boys, a relatively similar percentage of the boys and the girls got mark 4, whereas the lower marks were relatively more frequently given to the boys. A larger number of girls who obtained the highest mark were observed in both experimental groups, too. It can be inferred from the results that significant statistical differences in the final swimming skills of boys and girls are in favour of the latter.

***Table 2:** Difference in final swimming skills according to gender*

Group	N	χ^2	df	p-level (2-sided)
all groups	370	15.026	4	.005
control group (0)	129	10.964	4	.027
experimental group (1)	125	5.676	4	.225
experimental group (2)	116	3.915	4	.418

Table 3: *Control group final swimming skills according to gender*

Mark			Gender (GEN)		Sum
			Male	Female	
FSS	1	f	7	3	10
		expected f	6.357	3.643	10
		% within FSS	70	30	100
		% within GEN	8.537	6.383	7.752
	2	f	17	4	21
		expected f	13.349	7.651	21
		% within FSS	80.952	19.048	100
		% within GEN	20.732	8.511	16.280
	3	f	24	7	31
		expected f	19.705	11.295	31
		% within FSS	77.419	22.581	100
		% within GEN	29.268	14.894	24.031
	4	f	4	2	6
		expected f	3.814	2.186	6
		% within FSS	66.667	33.333	100
		% within GEN	4.878	4.255	4.651
	5	f	30	31	61
		expected f	38.775	22.225	61
		% within FSS	49.180	50.820	100
		% within GEN	36.585	65.957	47.287
Sum		f	82	47	129
		expected f	82	47	129
		% within FSS	63.566	36.434	100
		% within GEN	100	100	100

FSS - Final Swimming Skills (Table 1 standards)

DISCUSSION

We assume that by means of experimental programme 1, which differed from the control group (0) only in content, whereas the duration was the same, we met almost optimum conditions for swimming instruction in the age group of 8- to 9-year-old children who were used to the water, since the results of the experimental group with a longer programme (2) did not show a significant statistical difference if compared with those of the first experimental group (1).

The plan of experimental programmes 1 and 2 probably exerted the greatest influence on the results of the experimental groups. According to the hypothesis of variable practice, various forms of work (e.g.: obstacle courses, relays, additional tasks with special goals, integration and separation of groups, individualisation), content (e.g.: systematic progress of the implementation of the methodical units, testing of the swimming skills during the course) and equipment which were used enable the acquisition of a more diverse motor experience, a greater number of motor patterns and more experience in establishing the parameters within the motor patterns. Yan, Thomas and Thomas (1998) point out that such a practice is more effective in young children, as the motor patterns which could be used in acquiring new motor skills have not been sufficiently developed in these children.

The use of suitable didactic equipment in swimming instruction helps children to achieve a better feedback and feedforward since some equipment (swimming board, swimming buoys, swimming belt, etc.) enable some kinaesthetic information of the swimming stroke itself before they actually master this stroke. The increasing use of devices in practice (Sutlović, 1990; Lebar, 1994) as well as the results of some studies (Flisek, 1995) prove that the use of didactic equipment accelerates the teaching of swimming.

Swimming skills were tested twice during the experimental courses, which probably played an important role in the efficiency of the experimental programmes. As the individual marks given to evaluate the swimming skills were displayed at the swimming pool, the children knew the results of their swimming skills. This produced an augmented

feedback which, we believe, significantly influenced the motivation of the children; this opinion is also shared by Magill (1993). Magill also points out that augmented feedback is more important for movements where the performance of the task does not enable the executor to obtain sensory information which in turn can be effectively explained and used. Swimming skills are carried out in water where eyesight and hearing are impaired. Swimmers performing the breaststroke have a poor visual control of their movements and thus they rely mostly on kinesthetic feelings. Therefore, an augmented feedback probably plays a very important role in swimming instruction, which is also shown by the teachers' experience. Teachers who teach the strokes often move their pupils' arms and legs, which produces an augmented feedback. Based on the plan of the experimental programmes, instructors collapsed the original groups into larger ones or they split the groups up into smaller groups, which enabled a good individualisation of practice, very often in this form of practice itself.

The results of the final swimming skills show that the girls in this age group made better progress in swimming, since their percentage of the highest mark was noticably higher in all groups. It is assumed that girls in this age group make more rapid progress than boys because of their better flexibility (Kondrič & Pincolič, 1997), which enables a more efficient technique of the breaststroke, especially the movement of legs (knee and ankle flexibility).

As for the swimming skills the greatest differences between the genders was observed in the control group while the differences in both the experimental groups are insignificant. This is due to the fact that the experimental programmes exerted a more positive influence on the acquisition of swimming skills in both genders than the programme of the control group. The experimental programmes had a greater effect on the boys than on the girls, the reason being that almost the optimum conditions for the acquisitionof swimming skills of this age group were met. As girls learned faster, they achieved the maximum progress possible.

CONCLUSION

The results of the study offer much needed didactic support for physical education, since the new curriculum in Slovenia (1998) includes a 20-class swimming course in this age group and defines the standard of swimming skills (the task for mark 5 from Table 1 in the age group 11 to 12). The swimming course takes place ten times over a period of 14 days (60 minutes each class) and does not seem to disturb the in-school educational programme to a great extent. That is why it can represent an organisational model of swimming instruction for local communities which have similar conditions for swimming instruction. Programmes which are based on didactic starting points similar to those proposed by us can increase the efficiency of swimming instruction; this is validated by the better results of the swimming schools which have updated their programmes in accordance with the findings based on our study. At the same time such programmes represent the rationalisation of swimming instruction as fewer resources and less time will be needed for more advanced levels of swimming instruction. The findings can also be a basis for the preparation of other levels of swimming instruction determined in the National Programme of Sport in the Republic of Slovenia (2000).

In order to further improve swimming skills, children have to get used to the pool and its surroundings. That is why special water familiarisation courses have to be organised during the pre-school period. Programmes based on the starting points similar to those proposed by us may better serve the needs of the children who will not be used to water at this age.

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UČENJE PLIVANJA PRSNOM TEHNIKOM: USPOREDBA TRIJU PROGRAMA

SAŽETAK

UVOD

Posljednjih se godina u Republici Sloveniji ulažu znatni napori u poboljšanje sustava za poučavanje plivanja slovenske djece školske dobi. Usprkos tomu, provjere znanja plivanja provedene na djeci osnovnoškolske dobi nisu dale ohrabrujuće rezultate. Naime, uočeno je da jedna četvrtina djece viših razreda osnovne škole ne zna plivati pravilno (Jurak, Kovač, 1998). Puno je mogućih uzroka za takvu situaciju, a nedovoljna učinkovitost postojećih programa za učenje plivanja zacijelo je jedan od najvažnijih. Svrha je ovog istraživanja bila pronaći učinkovitiju metodu poučavanja plivanja. Pretpostavili smo da bi taj cilj bilo moguće postići suvremenijim, metodički bolje osmišljenim programom poučavanja plivanja, u okviru kojega bi se proces učenja temeljio na uporabi odgovarajućih raznolikih didaktičkih pomagala i opreme, kao i vremenski bolje usklađenim uključivanjem djece u program učenja.

METODE

Cilj istraživanja bio je utvrditi postoje li razlike u plivačkim vještinama među školskom djecom koja su plivačke vještine stekla sudjelujući u tri različita programa poučavanja plivanja. Pripremili smo dva eksperimentalna programa učenja plivanja (1 i 2) i usporedili smo ih s uobičajenim programom jedne ljubljanske škole plivanja (0). Oba su se eksperimentalna programa od uobičajenog razlikovala po sadržaju, a međusobno su se razlikovali s obzirom na trajanje. U okviru sva tri programa poučavalo se plivanje prsnom tehnikom.

Uzorak ispitanika činilo je 370-oro školske djece, u dobi od 8 i 9 godina, koja su pohađala drugi razred neke od ljubljanskih osnovnih škola (i grad i predgrađe). Eksperiment je proveden u školskoj godini 1997./98., u razdoblju od listopada do lipnja, na zatvorenim bazenima Športnega centra Tivoli u Ljubljani. Manji bazen bio je dubine od 0,8 do 1 m, a dubina većeg bazena iznosila je od 1,8 do 2m. Temperatura vode u oba bazena bila je 28° C, a temperatura zraka bila je 30° C. Dvadeset sedam učitelja plivanja vodilo je programe. U istraživanje su uključeni samo oni ispitanici koji su inicijalno pokazali da su prilagođeni na vodu, kao i one koji nisu izostajali s nastave. Prije početka programa, roditelji i ravnatelji škola obaviješteni su o ciljevima i tijeku istraživanja, za što su oni dali pismeno odobrenje. Kako bi se procijenili očekivani ciljevi, proveden je pedagoški eksperiment u kojemu je svaka grupa ispitanika radila prema drugačijem programu pouke plivanja. Razlike u znanju plivanja između grupa testirane su Pearsonovim $\div^2$- testom.

REZULTATI I RASPRAVA

Dobiveni rezultati pokazali su statistički značajne razlike u razini plivačkih vještina u ispitanika stečenih u različitim eksperimentalnim programima učenja plivanja ($p<0.018$). Statistički značajna razlika dobivena je na razini konačne procjene plivačkih vještina između ispitanika kontrolne grupe i onih iz eksperimentalnih grupa (između grupe 0 i 1: $p<.032$, između 0 i 2: $p<.007$). S obzirom na trajanje programa učenja plivanja, statistički značajna razlika među eksperimentalnim grupama nije utvrđena ($p<.587$). Na konačnoj procjeni znanja plivanja više je ispitanika unutar eksperimentalnih grupa ocijenjeno višim ocjenama nego što je to bio slučaj s kontrolnom skupinom. Stoga se moglo zaključiti da je statistički značajna razlika dobivena u korist ispitanika iz eksperimentalnih programa koji su iskazali višu razinu usvojenosti plivačkih vještina na finalnoj provjeri znanja plivanja.

Usporedba plivačkih vještina na razini spola rezultirala je statističkim značajnom razlikom u strukturi ocjena za dječake i djevojčice. Daljnjom analizom strukture vrednovanja završnog znanja plivanja na razini spola unutar svake pojedine grupe utvrđene su statistički značajne spolne razlike jedino u ispitanika kontrolne skupine. Usporedba dobivenih završnih ocjena u toj grupi pokazala je da su djevojčice dobivale nešto više ocjene u procjeni završnog znanja plivanja u odnosu na ukupan broj djece u programu. I u okviru obiju eksperimentalnih grupa uočljiv je veći broj djevojčica s višim ocjenama. Na temelju dobivenih rezultata moguće je stoga izvesti zaključak da je statistička značajnost razlika u procjeni završnog znanja plivanja na razini spola dobivena u korist djevojčica u kontrolnoj grupi, dok u okviru eksperimentalnih grupa razlike u usvojenim plivačkim vještinama s obzirom na spol statistički nisu potvrđene.

Pretpostavljamo kako prvi eksperimentalni program (program 1), koji se od kontrolnog programa razlikovao jedino po sadržaju, dok je ukupno trajanje programa bilo jednako, pruža optimalne mogućnosti za poučavanje plivačkih vještinama djece u dobi od 8-9 godina koja znaju plivati i koja su dobro prilagođena na vodu. Naime, rezultati dobiveni u drugoj eksperimentalnoj grupi (2), koja je provodila dugotrajniji program učenja prsne tehnike plivanja, nisu pokazali statistički značajnu razliku u odnosu na prvu eksperimentalnu grupu.

ZAKLJUČAK

Rezultati ovog istraživanja nude značajnu didaktičku podršku procesu sportske edukacije i novom nastavnom planu u Republici Sloveniji (1998), koji je proistekao iz plana za reformu slovenskog školskog sustava (1997), kojim se za djecu te dobi predviđa 20 sati za poučavanje plivanja i definiraju se standardi za usvajanje plivačkih vještina. Tečaj učenja plivanja predviđa 10 treninga (u trajanju od 60 minuta) tijekom 14 dana, i ne utječe negativno na ostale obrazovne procese. Upravo zato ovo istraživanje može predstavljati model kako na lokalnoj razini organizirati učenje plivanja u društvenim zajednicama koje imaju slične uvjete za realizaciju programa. Primjena ovog programa poučavanja plivanja rezultirala bi većom učinkovitošću i racionalizacijom na navedenoj razini, a za kasnije usavršavanje plivačkih tehnika utrošilo bi se manje vremena i novca.

***Ključne riječi**: učenje plivanja, djeca, prsni stil, usporedba programa*